GP 1721

1764

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of)
)
Deborah Wenzel .)
)
Serial No.: 09/228,821)
)
Filed: January 11, 1999)
)
For: COMPOSITION AS AN ADDITIVE TO CREATE CLEAR STABLE SOLUTIONS AND MICROEMULSIONS WITH A COMBUSTIBLE LIQUID FUEL TO IMPROVE COMBUSTION)

Group Art Unit: 1721

Examiner: Jerry D. Johnston

#12
10/18/00

Box Fee Amendment and Final Rejection
Assistant Commissioner of Patents
Washington, D.C. 20231

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to: Assistant Commissioner of Patents and Trademarks, Washington, D.C. 20231 on October 2, 2000.

Deborah Wenzel. 2 OCT 2000
Deborah Wenzel

Do not enter
10/20/00

DECLARATION OF DEBORAH WENZEL PURSUANT TO 37 C.F.R. 1.132

Sir:

I, Deborah Wenzel, declare that:

1. I studied philosophy, literature, music, theatre, and language at Bucknell University located in Lewisburg, PA and at Cornell University located in Ithaca, NY. I did not complete the degree programs at either university, but went on to pursue further study in philosophy.

2. I have been directly involved with experimentation and development of diesel fuel additives to improve combustion for the past six years and have worked with

technical specialists from several corporations and government agencies., including: the California Air Resources Board, the National Renewable Energy Laboratory, the Renewable Fuels Association, the US Department of Agriculture, the Henkel (now Cognis) Corporation, Union Camp (now Arizona Chemical) Corporation and the Southwest Research Institute (SwRI) of San Antonio, TX..

3. I have been directly and indirectly involved in the development of diesel engine and combustible fuel design through a personal family endeavor for the past thirty-five years.

4. My grandfather, John S. Wenzel, was an inventor of combustion engines and vehicle design. A portion of his work concerning diesel engines is found in U.S. Patent No. 2,445,720, issued in1948. A copy is enclosed.

5. My father, Edward C. Wenzel, was an inventor of combustion engines and fuel compositions. A portion of his work concerning diesel engines is found in U.S. Patent No. 3,608,530 issued in 1971 and in U.S. Patent No. 5,025,759, issued in 1991. A portion of his work concerning diesel fuel additives is found in U.S. Patent No. 4,063,698, issued in 1978. Copies are in the present record.

6. For two and one half years, following Mr. Wenzel's passing in 1994, I worked directly with Dr. Henry Steinman, who wrote a significant portion of U.S. Patent No. 4,083,698 with Edward C. Wenzel. In so doing, I gained a full understanding of the parameters of the patent invention.

7. I have subsequently worked independently for three years in the experimentation and development of diesel fuel additives to realize improvements in the prior art.

8. I am the sole inventor of the subject invention embodied in U.S. Ser. No. 08/884,960 ,and its Patent Cooperative Treaty (PCT) application PCT/US/00598, published as WO 99/35215 on 15 July 1999.

9. I have reviewed the specification, claims and figures of U.S. Ser. No. 08/884,960.

10. Applicant's present invention relates to the novel and unobvious disclosure and claims, as described below, which include, but are not limited to:

1) The inclusion of sufficient ethanol as the primary water-soluble alcohol.

2) The use of C3-5 alcohols as "low alcohol" co-solvents which reduce evaporation levels of the ethanol and contribute to overall solubility of the fuel composition - to create a stable microemulsion.

3) The use of C6 - C8 alcohols which greatly reduce evaporation levels of the ethanol/additive/fuel composition (orC1-C2 mixture), greatly enhance solubility of the additive in fossil fuel, and significantly decrease the proportion of neutralized fatty acids and/or ethoxylated necessary to produce a stable fuel composition.

4) The optional use of low-mole ethoxylated higher alcohols (C12-18) to further increase solubility, eliminate crystallization of the higher alcohols, and further decrease the proportion of neutralized fatty acids needed to produce a stable fuel composition.

5) The inclusion of appropriate lower and middle straight- or branched-chain alcohols (C2-C12), which significantly broadens the spectrum of possible feedstocks from which a useful fuel additive can be produced by incorporating components that can be wholly derived from coal or wholly derived from renewable components such as corn, palm, coconut, and fermented biomass.

DW 20 OCT 2000

6) The appropriate proportioning of each component as described in the invention, which produce the surprising results of meeting complex fuel characteristic and engine performance specifications, reducing pollution, and providing a means to effectively augment dwindling fossil fuel supplies by optimizing the use of coal, corn, soy, canola, peanut, safflower, tallow, tall oil, palm, coconut, and fermented biomass derivatives.

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7) This invention as presently claimed creates a novel microemulsion of the components which produced cleaner burning of the combustible fuel by at least 30 % when compared to the conventional combustible mixtures.

11. I have read and understand the primary reference which was cited in the equivalent PCT application PCT/US/00598, Schon et al., USP 5,004,479.

12. I have read and understand the Itow et al. reference cited in the equivalent PCT application USP 4,527,995.

13. The first and most apparent defect for both the Schon et al. and Itow patents is that they pertain specifically and only to the introduction of methanol as the water-soluble portion of the additive which is introduced into various fossil fuels using surfactant combinations.

The exclusive use of methanol as the only water-soluble alcohol renders either patent, or any combination of both inventions, unusable as a practical fuel additive in existing engines and or existing fuel systems.

The reason is that methanol is approximately ten times more aggressive as a solvent than ethanol. It will dissolve sensitive fuel system parts (especially fuel injection nozzles, gaskets, O-rings, and any other part that may contain rubber) and will eventually cause damage to the engine itself through pitting of the piston, or piston chamber, or both.

Even in the present invention which utilizes ethanol, optionally with a trace amount of methanol as a possible additional component, it is extremely important that the methanol content be strictly limited to about 5% or less of the total composition, specifically because of its aggressive solvent nature.

The second most obvious defect for the Schon et al. and Itow et al. inventions (especially as it relates

to diesel and other distillates) is that, in addition to the exclusion of ethanol (C2), the surfactant combinations for either Schon et al., or Schon et al. and Itow however combined, do not include alcohols ranging from C3 through C5 or C6 through C8. These particular alcohols are critical for producing balanced formulations in which higher alcohols (C12-C16) will not crystallize and (the lower alcohols C1 in the case of Schon et al./Itow) will not evaporate.

An additive formulation using only methanol and neutralized fatty acids will quickly

dissolve engine parts, produce highly combustible methanol vapors, and leave a sticky residue. An additive formulation using only methanol and C10-C16 will also dissolve engine parts, produce methanol vapors, and separate at low temperatures as the methanol absorbs ambient water which condenses.

An additive formulation that combines methanol, C10-16, and neutralized fatty acids, would reduce residue to the degree that C10-16 alcohols replaced fatty acids. Stability is improved to the degree that an appropriate proportion of neutralized fatty acids are utilized. However, the formulations of this cited art would still dissolve engine parts and produce unacceptable methanol vapors.

14. I have read and understand the Wenzel et al. reference cited in the equivalent PCT application, US Patent 4,083,698.

15. The first and most apparent defect for the Wenzel et al. patent especially as it relates to diesel fuel/other distillate fuels is its lack of lower alcohols C4-C5, and especially its lack of middle alcohols C6-12.

16. Without the presence of these alcohols, especially the C8 alcohols, the invention relies entirely on ethoxylated alcohols and neutralized fatty acids for its surfactant portion, necessitating a high concentration of both in order to produce a stable total fuel composition.

A fuel composition with too high a concentration of neutralized fatty acids leaves an unacceptable residue in fuel system and internal engine parts.

A fuel composition with too high a concentration of ethoxylated alcohols will adversely affect combustion because ethylene oxides do not burn well. A high enough concentration of ethylene oxide actually increases exhaust smoke, which conflicts directly with the objective of the invention to reduce pollution.

Also, both neutralized fatty acids and ethoxylated alcohols are extremely viscous compared to the viscosity of fossil fuels. Too high a concentration of either or both will adversely affect the viscosity of the total additive composition, which must match as nearly as possible the viscosity of the original fuel in order to be useful in existing fuel systems and

engines.

The presence of lower alcohols (C4-5) and middle alcohols (C6-12) and most especially middle alcohols (the C8 alcohols) in the present invention make it possible to greatly reduce the proportion of neutralized fatty acids needed to produce a stable fuel composition and to even further reduce or eliminate the need for ethoxylated alcohols.

The second most obvious defect of the Wenzel et al patent is its specified range of ethoxylated alcohols as having between 5 and 20 moles ethylene oxide. Besides the high quantity of ethoxylated alcohols required, the dense quality of the ethoxylates specified further guarantees a total additive composition that will not produce optimum combustion and is too viscous for optimum use in existing fuel systems and engines.

A third defect of the Wenzel et al patent is its lack of higher (C13-18) non-ethoxylated alcohols, which are important optional components in the present invention for regulating or enhancing cetane (combustibility) level of the total fuel composition in certain use applications.

It is also important, as outlined in the present invention, that very low levels of ethylene oxide (3 EO moles (units) or less) are optionally available for the purpose of enhancing stability and for reducing or eliminating the possibility of crystallization of the higher alcohols.

Finally, without the inclusion of middle (C6-12) alcohols, which have been shown to greatly reduce evaporation levels of lower alcohols (C1-2), while ethoxylated alcohols and neutralized fatty acids did not reduce evaporation levels, a defect of the Wenzel et al patent is that additive compositions of this invention will produce unacceptable levels of methanol/ethanol vapors.

16. In summary, the keys to the present invention as claimed are the following:

1) The inclusion of sufficient ethanol as the primary water-soluble alcohol.

2) The use of C3-5 alcohols as "low alcohol" co-solvents which reduce evaporation levels of the ethanol and contribute to overall solubility of the fuel composition - to create a stable microemulsion.

3) The use of C6-C8 alcohols which greatly reduce evaporation levels of the

ethanol/additive/fuel composition (or C1-C2 mixture), greatly enhance solubility of the additive in fossil fuel, and significantly decrease the proportion of neutralized fatty acids and/or ethoxylated alcohols necessary to produce a stable fuel composition.

4) The optional use of low-mole ethoxylated higher alcohols (C12-18) to further increase solubility, eliminate crystallization of the higher alcohols, and further decrease the proportion of neutralized fatty acids needed to produce a stable fuel composition.

5) The inclusion of appropriate lower and middle straight- or branched-chain alcohols (C2-C12), which significantly broadens the spectrum of possible feedstocks from which a useful fuel additive can be produced by incorporating components that can be wholly derived from coal or wholly derived from renewable components such as corn, palm, coconut, and fermented biomass.

6) The appropriate proportioning of each component as described in the invention, which produce the surprising results of meeting complex fuel characteristic and engine performance specifications, reducing pollution, and providing a means to effectively augment dwindling fossil fuel supplies by optimizing the use of coal, corn, soy, canola, peanut, safflower, tallow, tall oil, palm, coconut, and fermented biomass derivatives.

7) This invention as presently claimed creates a novel microemulsion of the components which produced cleaner burning of the combustible fuel by at least 30 % when compared to the conventional combustible mixtures.

This declaration was not submitted earlier because Applicant fully expected that the prior response would have been sufficient to obtain allowable claims.

Applicant requests that this declaration be entered into the record.

APPLICANTS' PRESENT RESULTS ARE SURPRISING AND UNEXPECTED IN VIEW OF THE ART CITED BY THE EXAMINER IN THE PCT APPLICATION WHICH IS DESCRIBED AND DISCUSSED HEREINABOVE.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Further, Declarant says not.

Date: 2 Oct 2000

Deborah Wenzel

Deborah Wenzel

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July 20, 1948. J. S. WENZEL 2,445,720

OPPOSED CYLINDER TWOCYCLE ENGINE

Filed Sept. 26, 1945 2 Sheets-Sheet 1

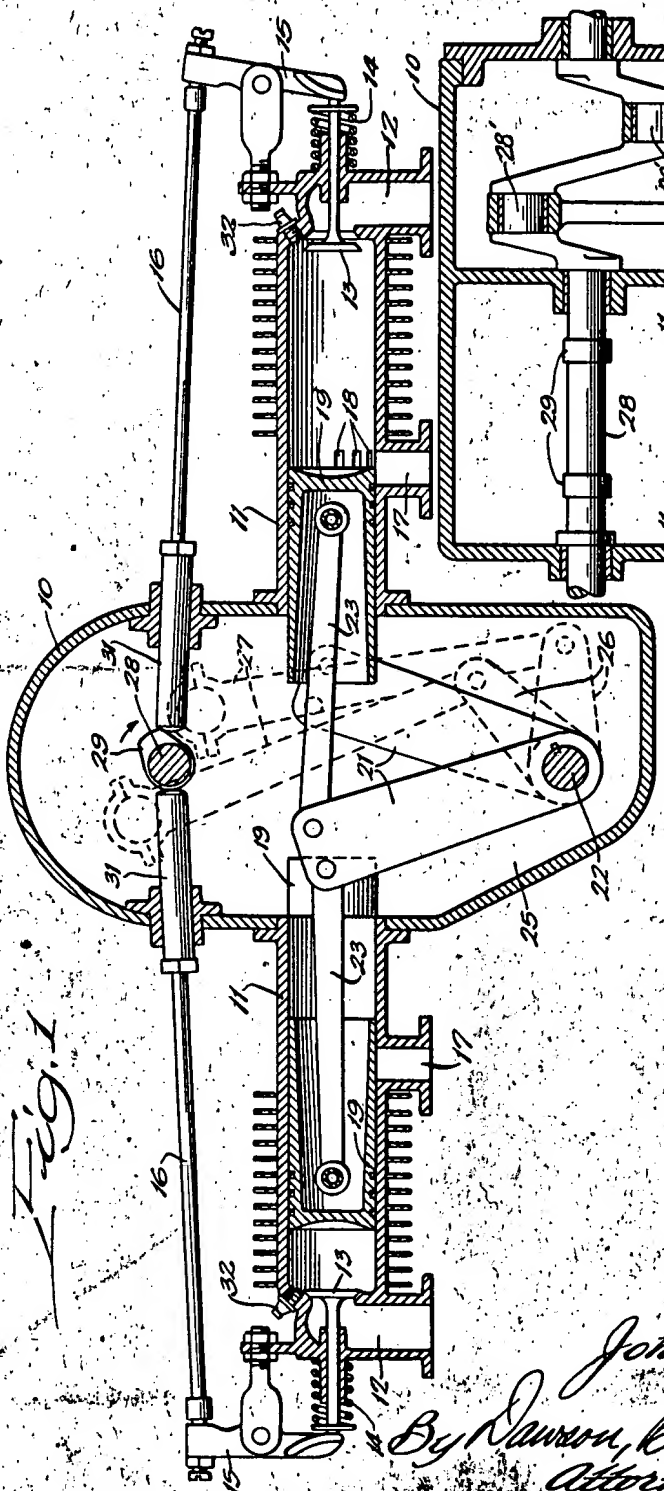

Fig. 1

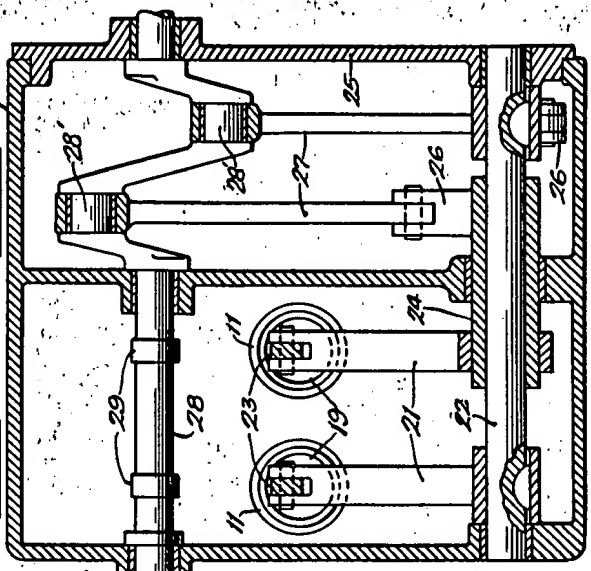

Fig. 2

Inventor:
John S. Wenzel.
By Dawson, Booth & Strasser,
Attorneys.

July 20, 1948. J. S. WENZEL 2,445,720

OPPOSED CYLINDER TWOCYCLE ENGINE

Filed Sept. 26, 1945 2 Sheets-Sheet 2

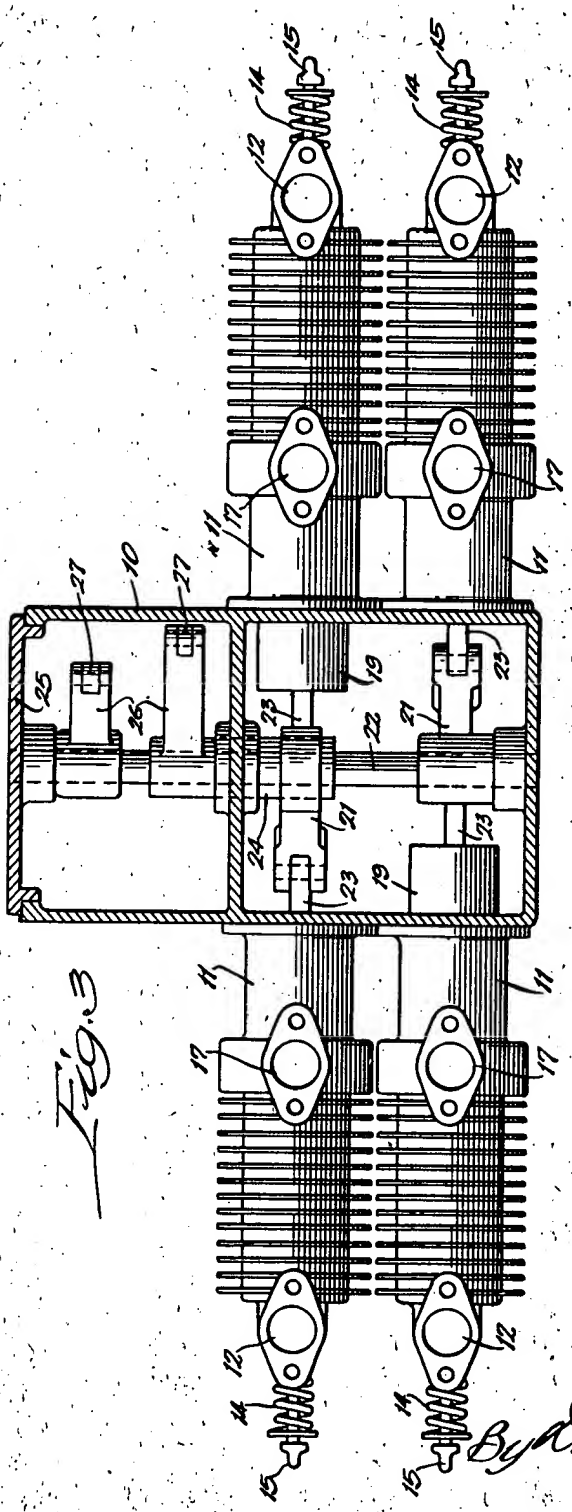

Fig. 3

Inventor:
John S. Wenzel,
By Dawson, Booth & Strasser,
Attorneys.

Patented July 20, 1948 2,445,720

UNITED STATES PATENT OFFICE

2,445,720

OPPOSED CYLINDER TWO-CYCLE ENGINE

John S. Wenzel, Manchester, Conn., assignor to Wenzel, Wenzel, Macquire & Richardson, a partnership

Application September 26, 1945, Serial No. 618,684

7 Claims. (Cl. 123—56)

1

This invention relates to engines and more particularly to internal combustion engines of the lever type.

One of the objects of the invention is to provide an engine which will deliver an extremely high torque at a light weight per horse-power.

Another object is to provide an engine which is simple in construction which provides a minimum number of parts and which occupies a minimum volume.

Still another object is to provide an engine which operates at extremely high efficiency. This is accomplished by providing a relatively long piston stroke to produce optimum expansion of the gases.

The above and other objects and advantages of the invention will be more readily apparent from the following description when read in connection with the accompanying drawing, in which—

Figure 1 is a longitudinal section through an engine embodying the invention;

Figure 2 is a transverse section through the central casing of Figure 1; and

Figure 3 is a horizontal section looking up from the bottom of Figure 1.

The engine, as shown, comprises a central casing or housing 10 which may, if desired, contain a body of lubricant and which serves as the crankcase of the engine. Secured to the central casing and projecting outwardly from the opposite sides thereof are aligned opposed pistons 11 which are arranged in pairs. As shown in Figures 2 and 3, two such pairs of cylinders are provided, although it will be apparent that any desired number of cylinders could be employed.

The engine, as shown, is adapted to operate on a two stroke cycle and for this purpose the outer end of each cylinder is connected to an intake passage 12 communicating with a source of combustible mixture under pressure. Admission of the mixture to the cylinder is controlled by an intake valve 13 of the poppet type urged toward its seat by a spring 14. The valves 13 are adapted to be opened by rocker arms 15 engaging the outer ends of the valve stems and controlled by push rods 16 in a manner to be described hereinafter. Exhaust of combusted mixture from the cylinders is through exhaust passages 17 communicating with the cylinders through elongated exhaust ports 18 adjacent the inner ends of the cylinders. A piston 19 is slidable in each cylinder and is formed with an elongated skirt which will close the exhaust ports 18 when the cylinder is in its extreme outer position.

Within the casing 10 there is provided a rocking lever 21 for each pair of cylinders. The outermost lever 21 is connected to a shaft 22 displaced laterally from the axis of the cylinders and extending transversely thereto through the casing. The free end of the lever lies between the corresponding pair of cylinders 11 and is connected to the pistons in such cylinders by connecting rods 23. The nearest adjacent lever 21 is secured to a sleeve 24 which is rotatable on the shaft 22 and has its free end lying between its pair of cylinders and similarly connected to the pistons therein. Where additional pairs of cylinders are employed, additional sleeves similar to the sleeve 24 may be provided to carry levers for such pairs of cylinders.

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The shaft 22 and the sleeve 24 extend beyond the casing 10 into an extension thereof indicated at 25. Within the casing extension 25 the sleeve and the shaft carry crankarms 26 which are connected through connecting rods 27 to oppositely disposed crank throws 28' on a crankshaft 28. The crankshaft 28 extends parallel to the shaft 22 through the upper part of the casing 10 and the casing extension 25 and may be connected to any desired mechanism to be driven.

To control the valves 13, the crankshaft is formed with cams 29, there being one cam for each pair of cylinders. Each of the cams 29 operates on a pair of cam follower blocks 31 connected to the push rods 16. As best seen in Figure 1, the cams 29 are single lobe cams so that each of the valves 13 of a pair of cylinders will be opened once during each revolution of the crankshaft.

In operation of the engine with the crankshaft turning in the direction of the arrow in Figure 1, the intake valve of the right-hand cylinder is open and the exhaust ports 18 are also open. At this time a fresh charge under pressure enters the right-hand cylinder to scavenge the combusted charge from the cylinder and to recharge it. At the same time a charge in the left-hand cylinder is being compressed and will be fired as, for example, by a spark plug 32 when the cylinder reaches the outer end of its stroke. This explosion will drive both pistons to the right and will rock the lever 21 connected thereto to turn the shaft 22 and to rotate the crankshaft through the connecting rod 27. As the pistons travel to the right the charge in the right-hand cylinder will be compressed while that in the left-hand cylinder is burning and expanding as will be understood.

It will be noted that during this operation the inertia of the pistons and the lever connected thereto is dissipated in compressing the charge in the freshly charged cylinder so that at the end of the working stroke the parts will come gradually to rest preparatory to a reversal of motion when the charge in the opposite cylinder is fired. Thus, substantially all of the energy imparted to the engine is utilized in useful work to produce an efficiently operating engine.

The efficiency is further improved by providing an extremely long stroke for the pistons which

is permissible due to absorption of the inertia forces. It will be seen that the stroke of the pistons is extremely long relative to their diameter so that the burning charge can be substantially fully expanded prior to opening of the exhaust ports. By this means, the maximum useful energy in the charge is extracted therefrom.

Due to the arrangement of the cylinders in opposed pairs it is possible to obtain a well balanced and smooth running engine by simultaneously firing cylinders on opposite sides of the engine. For example, in a four cylinder engine as shown, the cylinder of one pair on the left side of the engine fires at the same time as the cylinder of the other pair on the right side of the engine. In this way the forces are maintained in balance so that the engine runs smoothly at all speeds.

While one embodiment of the invention has been shown and described in detail herein, it will be understood that this is illustrative only, and is not intended as a definition of the scope of the invention, reference being had for this purpose to the appended claims.

What is claimed is:

1. An engine comprising a pair of opposed cylinders, pistons in the cylinders, valves to control supply of a combustible mixture to the outer ends of the cylinders, exhaust means communicating with the cylinders adjacent their inner ends whereby the pistons operate on a two stroke cycle, a lever pivoted on an axis displaced laterally from the cylinders with its free end lying between the inner ends of the cylinders, connecting rods connecting the pistons to the free end of the lever, a crankshaft, means including a connecting rod connecting the lever to the crankshaft to rotate the crankshaft as the lever is oscillated, a cam on the crankshaft, and means operated by the cam to control the valves.

2. An engine comprising a central casing, cylinders opening into the casing and extending therefrom in opposite directions, pistons in the cylinders, a lever pivoted in the casing on an axis spaced laterally from the cylinders with its free end lying between the cylinders, connecting rods connecting the pistons to the free end of the lever, a crankshaft extending through the casing, means connecting the lever to the crankshaft to rotate the crankshaft as the lever oscillates, a cam on the crankshaft in the casing, and valves in the cylinders operatively connected to the cam to be controlled thereby.

3. An engine comprising a central casing, cylinders opening into the casing and extending therefrom in opposite directions, pistons in the cylinders, a lever pivoted in the casing on an axis spaced laterally from the cylinders with its free end lying between the cylinders, connecting rods connecting the pistons to the free end of the lever, a crankshaft, means connecting the lever to the crankshaft to rotate the crankshaft as the lever oscillates, a cam on the crankshaft, valves in the outer ends of the cylinders controlled by the cam, and exhaust means communicating with the cylinders adjacent their inner ends whereby the pistons operate on a two stroke cycle.

4. An engine comprising a central casing, cylinders opening into the casing and extending therefrom in opposite directions, pistons in the cylinders, a shaft pivotally mounted in the casing spaced laterally from the cylinders and extending transverse to the cylinder axes, a lever carried by the shaft with its free end between the inner ends of the cylinders, connecting rods connecting the pistons to the free end of the lever, mixture inlet valves in the outer ends of the cylinders, exhaust means communicating with the cylinders adjacent their inner ends whereby the engine operates on a two stroke cycle, a crankshaft, a crank arm on the crankshaft, a connecting rod connecting the crank arm and the lever, and a cam on the crankshaft controlling the mixture inlet valves.

5. An engine comprising a central casing, a plurality of pairs of opposed cylinders opening into the casing, pistons in the cylinders, a lever pivoted in the casing for each pair of cylinders with its free end lying between the cylinders, connecting rods connecting the pistons to the levers respectively, a crankshaft having a number of crank throws equal to the number of levers, a shaft connected to one of the levers, a sleeve rotatable on the shaft connected to another of the levers, crank arms on the shaft and sleeve, and connecting rods connecting the crank arms and crank throws respectively.

6. An engine comprising a central casing, a plurality of pairs of opposed cylinders opening into the casing, pistons in the cylinders, a lever pivoted in the casing for each pair of cylinders with its free end lying between the cylinders, connecting rods connecting the pistons to the levers respectively, a crankshaft having a number of crank throws equal to the number of levers, means connecting the levers respectively to the crank throws, a cam on the crankshaft for each pair of cylinders, valves in the outer ends of the cylinders controlled by the cams respectively, and exhaust means communicating with the cylinders adjacent their inner ends whereby the engine operates on a two stroke cycle.

7. An engine comprising a central casing, a pair of opposed cylinders opening into the casing which are long relative to their diameters, inlet valves at the outer ends of the cylinders, exhaust means communicating with the cylinders adjacent their inner ends, pistons in the cylinders having skirts of a length to cover the exhaust means when the pistons are in their outermost positions, a lever pivoted in the casing on an axis spaced from the cylinders with its free end lying between the cylinders, connecting rods connecting the pistons to the free end of the lever, a crankshaft, means connecting the lever to the crankshaft to turn it as the lever oscillates, and a cam on the crankshaft controlling the inlet valves.

JOHN S. WENZEL.

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The following references are of record in the file of this patent:

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2,215,202	Wormsley	Sept. 17, 1940
2,383,648	Hawkins	Aug. 28, 1945